NERC System Protection Initiative

Analysis of system disturbances since 1965 has shown as the poor performance of automated systems designed to protect infrastructure from damage during severe system conditions. System protection devices and schemes were a causal factor in nearly 45% of category two and higher system disturbances in 2007 and have contributed to every major system disturbance since 1965. In order to address this issue and to limit the scope and severity of bulk power system disturbances in North America, the North American Electric Reliability Corporation (NERC) sent a letter to its stakeholders announcing a new Sysem Protection Initiative. The following text is the core of the letter signed by Rick Sergel, President & CEO of NERC:

MISOPERATION OF SYSTEM PROTECTION and control systems have been a leading cause of bulk power system disturbances in North America for a number of years, causing nearly 45% of category two and higher disturbances in 2007. As part of its mission to "ensure the reliability of the bulk power system in North America," NERC is launching a comprehensive initiative designed to coordinate many valuable ongoing efforts to improve the performance of power system protection and control systems, and thereby limit the scope and severity of future system disturbances.

The System Protection Initiative will initially focus on the following areas:

- ***Relay Loadability***: Standard PRC-023 – Relay Loadability, as approved by the NERC Board of Trustees, has been filed with FERC for approval in the United States. This codification of the relay loadability review, which began in 2004 in direct response to the August 14, 2003 blackout recommendations, should be approved and implemented as a mandatory and enforceable reliability standard throughout North America.
- ***Protection System Redundancy:*** The System Protection and Control Subcommittee (SPCS) of the NERC Planning Committee completed a Technical Reference paper and Standards Authorization Request to reinstate a standard on protection system redundancy. Recently posted for comment, the SAR is expected to be approved in 2009. NERC staff, working with the Standards Committee and stakeholders, will seek to expedite the development of this critical standard.
- ***Protection System Coordination***

Transmission Protection System Coordination

Coordination of transmission system protection between interconnected transmission systems should include intra- and inter-transmission owner coordination throughout the planning process and at the time of any system topology changes, such as additions, modifications, or retirements of facilities. This issue is being addressed as part of the development of standard PRC-001-2 – System Protection Coordination.

Transmission Protection Coordination with Generation Protection Systems

Coordination between generation and transmission protection systems – including those on generator step-up (GSU) transformers – is critical to the reliability of the bulk power system. Miscoordination of those systems has caused two significant system disturbances in the past two years, and resulted in the unnecessary loss of generation during seven additional disturbances in that timeframe. Particular attention must be given to the performance requirements placed on both protection systems by generator response characteristics during transient, sub-transient, and steady-state conditions.

A task team under the SPCS, in coordination with the IEEE Power System Relay Committee (PSRC), is working on a Technical Reference paper to address these issues. The

Data courtesy to:
NERC- the North American Electric Reliability Corporation

paper is expected to be submitted to the Planning Committee in June, supporting the ongoing work of the System Protection Coordination Standard Drafting Team to update standard PRC-001 – System Protection Coordination.

Transmission Protection and System Performance Coordination with Generator and Turbine Control Systems

Coordination between transmission protection systems and expected performance of generator and turbine control systems is an essential, but often overlooked, aspect of overall system design and operation. All aspects of generator and turbine control and response to external system conditions must be understood by the Transmission Owner, Transmission Operator, Planning Coordinator, and Reliability Coordinator. Of particular concern are the expected generator control responses to close-in faults (transient and sub-transient), depressed voltage conditions (including auxiliary power supply expected performance), and off-nominal frequency conditions (including transient frequency excursions). Proper coordination should include more detailed dynamics modeling of generator control characteristics and additional modeling of key turbine control performance parameters. A sub-team under the SPCS is being formed with additional experts in the field of turbine controls to write a Technical Reference paper that will explain the interaction between turbine controls and system protection during adverse system conditions. That work will be blended with the sub-team on generator protection and transmission protection coordination to provide a comprehensive backdrop for potential generation protection and control system guidelines and standards. All such work will be closely coordinated with the IEEE PSRC and Power and Energy Society (PES).

■ Generator Frequency and Voltage Protective Relay Coordination - Generator protective frequency and voltage relay settings must be coordinated with both system under-frequency load shedding and system under- and over-voltage protection systems. The Standards Project 2007- 09 – Generator Verification drafting team is currently developing Standard PRC-024-1 - Generator Frequency and Voltage Protective Relay Settings – which is designed to address this issue.

■ Transmission and Generation Protection System Misoperations — The SPCS is preparing a technical review of PRC-004 – Analysis and Mitigation of Transmission and Generation Protection System Misoperations and all other standards related to relay misoperations. Part of that review includes a NERC-wide definition of protection misoperations for use in system performance metrics. The review is expected to be presented to the Planning Committee in June.

■ Protection System Maintenance - In 2007, the NERC System Protection and Control Task Force published a Technical Reference on Protection System Maintenance in support of modifications being made to PRC-005 – Transmission and Generation Protection System Maintenance and Testing. Standards Project 2007-17 – Transmission and Generation Protection System Maintenance and Testing is in the re-drafting phase. ■

> The SP Initiative will continue to be a top priority for NERC, our committees, and standards drafting teams throughout 2009 and the years to come.
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> **System Protection Initiative assignment:**
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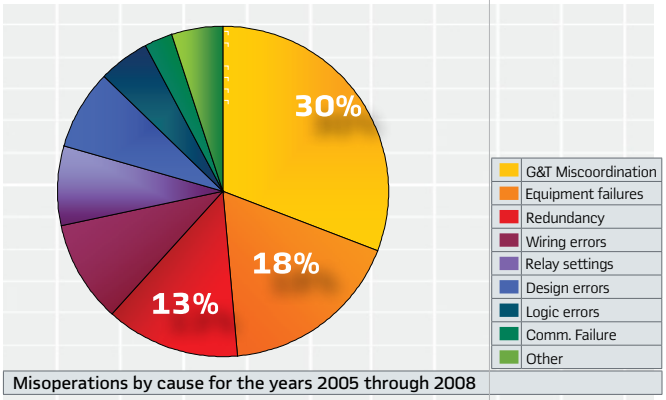
> **Bob Cummings, Director of Event Analysis and Information Exchange was assigned to lead this effort for NERC.**

1 Bulk power system disturbance by cause

2 Protection system misoperatons



Misoperations by cause for the years 2005 through 2008